Creating a Robust Local Area Network for Internet of Things.

Enabling the Internet of things to happen within a business environment is not a simple thing to do. Ultimately, having everything connected requires significant planning. The foundation to having a business's building IoT enabled is the local area network. What is critically important in local area network design is taking a financially and operationally sound approach focusing on the desired end state prior to defining LAN requirements. There are three main technical factors when considering a LAN refresh to support IoT end points:

- Speed – bandwidth speed to support the end devices being connected.
- PoE – the ability to provide power to an end point such as an IP phone, IP Camera or Access Point.
- QoS – the ability to provide a platform that gives priority for latency applications such as voice and video.

This whitepaper highlights a customer centric approach to creating a robust LAN platform to support all IoT requirements in a cost effective and operationally sound manner.

Begin with the end in mind.

Many decision makers looking to migrate to IP should clearly define the desired end state. What IoT end points and applications are important to the business? What things do we not want to risk or compromise in the sake of being connected? Is my network ready to support the IP based applications and devices we are considering? Will my team be able to handle the evolution? What is my ROI?

For many business the IoT revolution has already begun. We can bulk the LAN considerations for IoT applications and end point into core business requirements and supporting requirements.

- Core business LAN – these are the switches that connect devices that are used by staff to drive revenues, operate effectively and make the business successful. We refer to this as the Profit Network.
- There are three other supporting platforms migrating to the internet of things.
    - o Voice – Migration to IP telephony and collaboration.
    - o Physical Security – IP Cameras, access control and enhanced applications.
    - o Building Controls - (not shown in image) PoE Lighting, PoE climate control and other building oriented devices.

The common requirement is having PoE switches able to connect the applications to end points located throughout the building. Planning and preparation to create a LAN platform to support all the different requirements is critically important. A LAN readiness study of 1,400 companies completed by Nemertes found that over 60% of businesses underestimated LAN readiness costs with an average cost of $421 per drop to get the LAN ready for IP telephony.

The Core and Supporting Business Networks
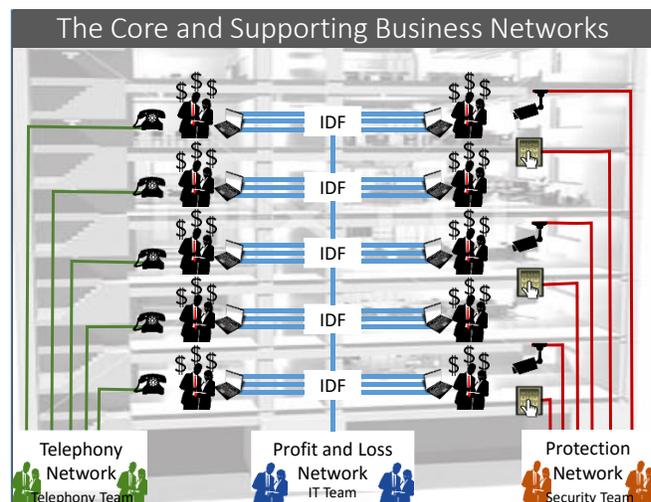
Avoid LAN design mistakes made when migrating IoT end point in business.

One of the biggest mistakes made when designing the LAN upgrade is creating a network topology based on the limitations of standard PoE switches and not considering some recent switch innovations. The first Ethernet switch was introduced by Kalpana in 1990. Over the years we have seen enhancements to switch capabilities; greater speeds, routing, power, and quality of service. There are two things that has not changed in over 25 years to "standard" LAN switches; the need for multiple pairs of UTP cable and the maximum reach the switch can deliver connectivity to the end point over the UTP cable is 100 meters or 326 feet.

Many LAN designs are based on using standard LAN switches with their wiring and distance limitations. As a result, many customers believe that the only option is to rip-and-replace infrastructure and install new "standard" PoE switches in existing or new IDF closets. This is often the number one barrier to business migrating to an all IP platform. The below table is a summary of things to consider when establishing a new LAN platform using standard switch technology and is often overlooked.

Requirement	Cost	Time	Disruption/ Risk	ROI Contributor
New CAT 5E or CAT 6 cabling to support PoE switches	Yes	Yes	Yes	No
Moving end point connectivity from MDF closet IDF closets given reach limitations of PoE switches results in additional requirements including:				
Additional rack space in IFD closets	Maybe	No	No	No
Power source given the power requirements for PoE switches and devices connected to them	Yes	Yes	Yes	No
Cooling requirements for IDF closet given the heat being created from new PoE switches and power draw	Yes	Yes	No	No
Back-up power to support uptime similar to legacy systems	Yes	Yes	Yes	No
Professional services to design, manage work required	Yes	Yes	Yes	No
New switches to support speed, power and QoS	Yes	Yes	Maybe	No

The financial challenge is that establishing the LAN backbone is not the ROI driver. The drivers are the new applications and end point being deployed. The LAN backbone needs to support the ROI drivers. The question is how do we create a robust LAN platform to support my IP migration? The answer is simple – read on.

Start by putting first things first not second things first.
The first thing to consider is what application and end point you are considering migrating to IP. Second is understanding the LAN strategy to support the end points being deployed. Considerations include:

1. What IP end point and in what location am I looking to deploy it?
2. How much bandwidth is required to serve that device and requirement today and in the future?
3. Does that device require power?
4. Do I want the IP end point and application on my production network? What are my risks of doing so?
5. Should I have a separate LAN for the IP applications being considered?
6. Is there an existing infrastructure that can be leveraged?
7. How far is the end point from the closest IDF closet if I was to use standard PoE switches?
8. What IDF costs will we incurred if I am introducing new switch requirements?
9. What are the costs, risks and benefits to creating the platform to support the requirement?
10. Is there a justifiable ROI for the investment in devices, infrastructure and applications being considered?

Many business do not gain the benefits of an all IP platform because of the costs, risks, time and disruption of building out a LAN using standard PoE switches.

It is ignorant to think that in a world of constant innovation and technology advancement that a switch limitation that has existed for 25 years is not solved. The biggest mistake businesses can make is designing a LAN without regard to recent switch innovations that break the barriers and make IP migration quick, easy and cost effective.

Switch innovations that make optimizing the LAN for IoT quick, easy and cost effective.

Some of the most exciting switch innovations in recent years is the creation of long reach PoE switches that allow customers to transform their existing voice infrastructure, coax or multi pair UTP into a robust IP platform ideal for many of the IP end points being considered.

NVT Phybridge are pioneers and leaders in long reach PoE switch technology. They were the first company to design switches that delivers Ethernet and PoE over a single pair of wire with 4 times the reach of traditional switches and the first company to create the CLEER switch, a 24 port managed Ethernet over coax, long reach PoE switch. The FLEX switch was introduced this year that provided Ethernet and UPoE over 2 or 4 pairs of wire with 5 times the reach of traditional switches.

The NVT Phybridge Chariot series of long reach PoE switches are enterprise grade switches allow businesses to transform their existing infrastructure into an IP platform with power making IP migration simple.   These switches eliminate the need to rip-and-replace infrastructure allowing for a graceful, non-disruptive, and cost effective way to migrate to IP.

PoLRE 24, 48 and LPC Switches

IP Device
1,500ft (457m) Away

Ethernet (10 Mbps, full duplex) & PoE over
Single Pair UTP with 4 Times the Reach

Supports any IEEE
802.3 AF/AT IP
Device

Flex 24, and 8 Port Switches

IP Device
2,000ft (609m) Away

Fast Ethernet (100 Mbps, full duplex) & PoE+
over 2 & 4 Pair with 5 Times the Reach

CLEER & EC 10 Switches

IP Device
2,300ft (701m) Away

Fast Ethernet (100 Mbps, full duplex) & PoE+ over Coax
with 6 Times the Reach

EC Link

Standard PoE Switch

IP Device
2,300ft (701m) Away

IDF Closet   IDF Closet   IDF Closet   IDF Closet   IDF Closet   IDF Closet

Image the cost savings being realized when an end point that is 700 meters (2,300 ft) away can be supported by the existing coax cable using the CLEER switch vs. having to build out 6 IDF closets and new Ethernet cable.
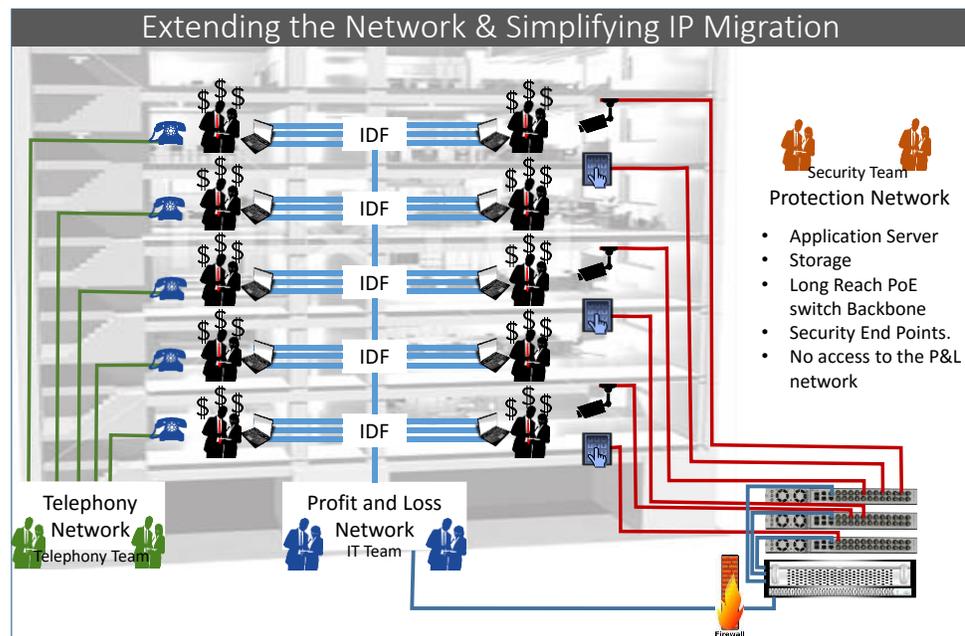
Upgrading your Physical Security Solution to IP can be simple.

A LAN upgrade for the Internet of Things can and should consider extending the LAN by leveraging the long reach PoE switches. Let's start by answering the questions concerning most decision makers having the knowledge of these long reach PoE switches.

1. What IP end point and in what location am I looking to deploy it? IP cameras replacing analog cameras
2. How much bandwidth is required to serve that device and requirement today and in the future? Between 3mbps and 50mbps and decreasing. What is important for real-time applications is availability of bandwidth. The point-to-point topology and dedicated bandwidth per end point ensures the availability and amount of bandwidth is available regardless of loads on the production or other networks.
3. Does that device require power? Yes between 5 watts and 30 watts
4. Do I want the IP end point and application on my production network? What are my risks of doing so? No, given bandwidth requirements of streaming video it is recommended to have a physically separate LAN for IP security.
5. Should I have a separate LAN for the IP applications being considered? Yes, best practice
6. Is there an existing infrastructure that can be leveraged? Yes the coax infrastructure is point-to-point and with new long reach PoE over coax switches I can leverage this infrastructure.
7. How far is the end point from the closest IDF closet if I was to use standard PoE switches? Not an issue, using the CLEER switch and leveraging the existing coax.
8. What IDF costs will we incurred if I am introducing new switch requirements? No IDF closet requirements. I am able to leverage the existing infrastructure in the MDF supporting the legacy system.
9. What are the costs, risks and benefits to creating the platform to support the requirement? With CLEER I can transform the existing coax infrastructure and migrate to IP with no disruption or risk. The costs will be defined and lower than the alternative of ripping and replacing the infrastructure and establishing or increasing the demands on IDF closets.
10. Is there a justifiable ROI for the investment in devices, infrastructure and applications being considered? Yes, by repurposing the existing infrastructure we can allocate more of our budget to applications driving a better return on investment vs. spending more on infrastructure.

The LAN designs below illustrates the simplicity and flexibility available when migrating to IP. The beauty of this topology is that the security team can manage and control the IP based solution end-to-end with no impact or access to the core production network. The IT department can create a topology that is secure not allowing the security team to access the core network but can integrate the security end point into their overall network monitoring and management platform if desired. The customer and the IT departments have full control.

Extending the Network & Simplifying IP Migration

IDF
IDF
IDF
IDF
IDF

Security Team
Protection Network

- Application Server
- Storage
- Long Reach PoE switch Backbone
- Security End Points.
- No access to the P&L network

Telephony Network
Telephony Team

Profit and Loss Network
IT Team

Firewall

What if the customer has limited budget available in the current year? It is simple to complete a partial migration with the new IP end points connected to the CLEER switch via the existing coax. The CLEER switch is connected to the server or NVR. The IP base solution is sitting side by side with the older analog based solution. The diagram on the left shows a single connection between the CLEER switches and Security based applications allowing the IT team to have access and monitor the extended network if desired. The diagram on the right shows no connection between the core network and the production network keeping them completely separate if desired.
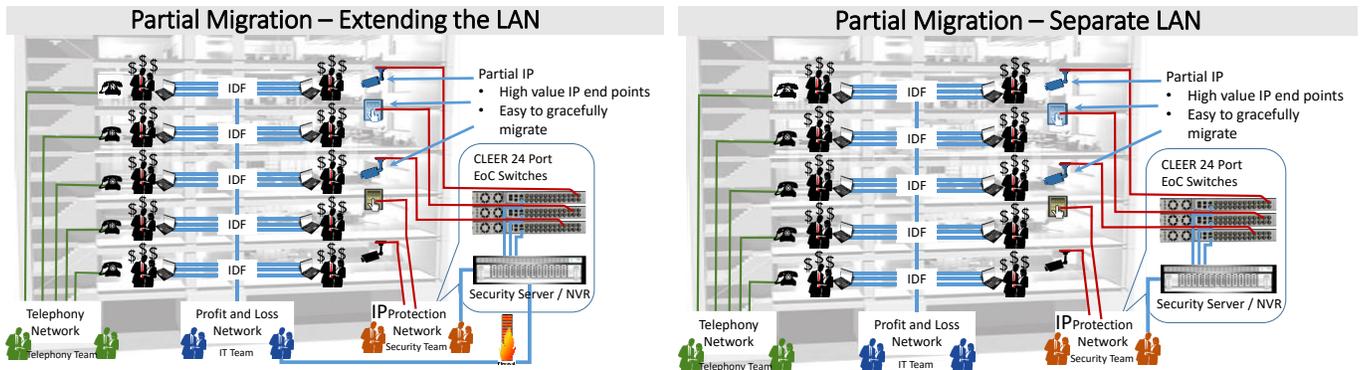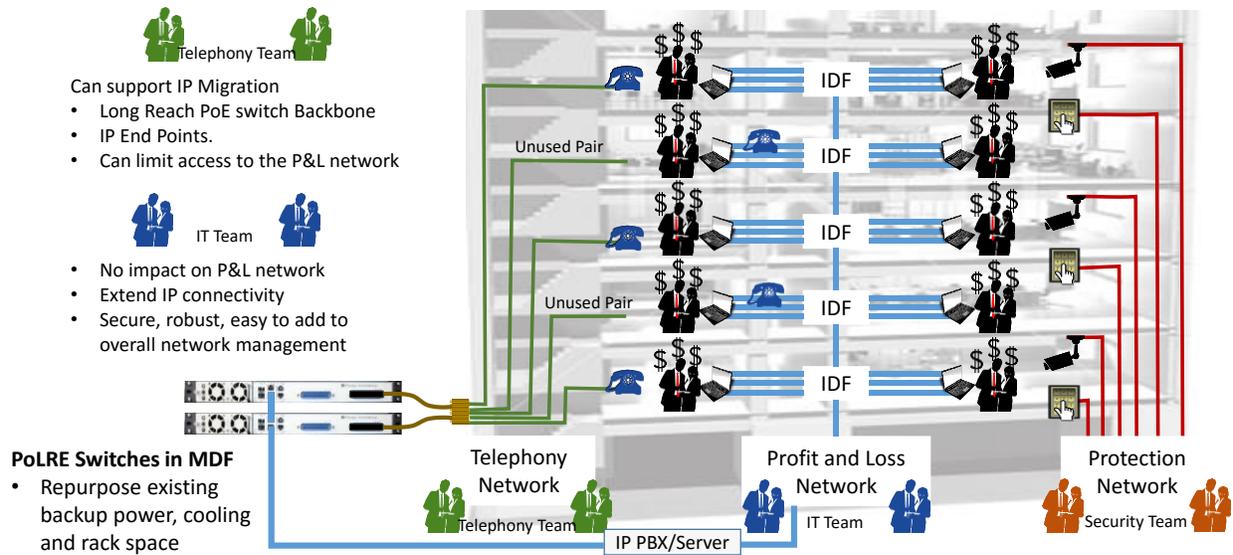

Moving from partially migrated to full migration when budget comes available and moving from an extended LAN to separate LAN is created by removing a single wire that connects the security IP stack from the core network. The diagram on the left shows the connection between networks and the right illustrates the physical separation.
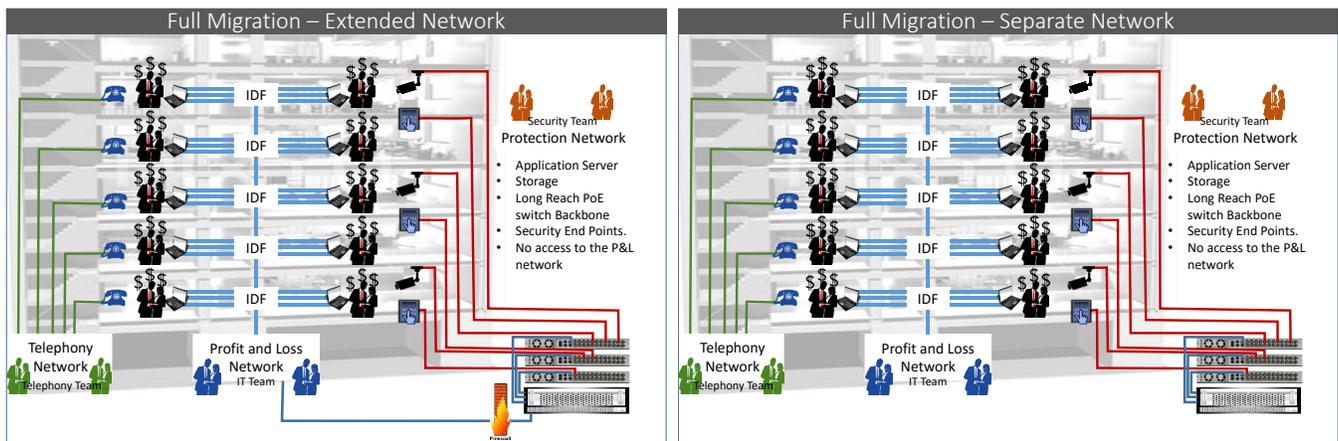
Migrating to full IP telephony solution can be just as simple. The PoLRE switches transform the existing the two wire infrastructure into an IP path with power ideal for the new IP phones. Many businesses have phones in locations where data ports do not exist and these area are ideal for PoLRE consideration. There is no need to rip-and-replace infrastructure if all that is required is connectivity and power to support and IP phone. You can optimize your LAN upgrade with PoLRE in a more economical and operationally efficient manner driving a better return on investment.

Extend the LAN with PoLRE and Enabling an all IP Platform
Quick, Easy and Cost Effective IP Migration Integrating with Existing LAN

Telephony Team

Can support IP Migration
• Long Reach PoE switch Backbone
• IP End Points.
• Can limit access to the P&L network

IT Team

• No impact on P&L network
• Extend IP connectivity
• Secure, robust, easy to add to overall network management

Unused Pair

Unused Pair

IDF

IDF

IDF

IDF

IDF

PoLRE Switches in MDF
• Repurpose existing backup power, cooling and rack space

Telephony Network

Telephony Team

IP PBX/Server

Profit and Loss Network

IT Team
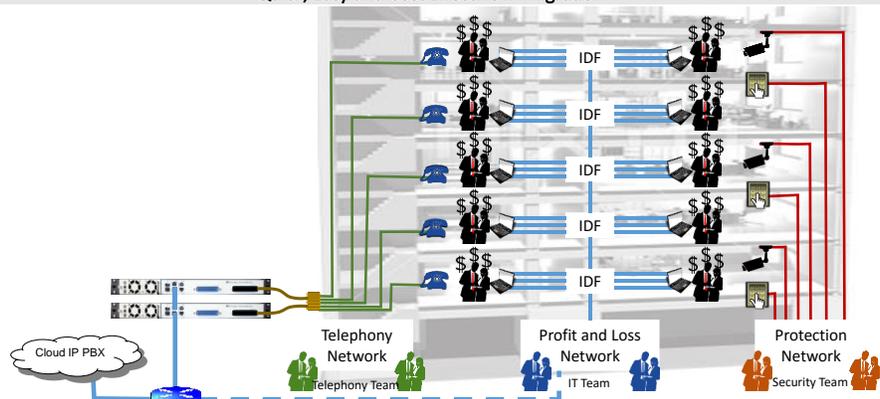
Protection Network

Security Team

Creating a better experience for hosted based customers and providers.

One of the biggest challenges faces by providers and customer wanting to migrate to a hosted VoIP platform is the dependency on the LAN to be ready for the new IP phone and application at time of deployment and on an ongoing bases. Most quality of service or poor user experience issues are identified as networking issues. The PoLRE switch allows providers and customers to easily migrate to a hosted platform gaining end-to-end control over the experience with no dependencies on the LAN.

The diagram shows all new IP phones on a PoLRE backbone connected to the Cloud via the router. The customer and provider has the option to connect into the production LAN if desired via a single connection.

There are many benefits including: easy of migration, repeatable, predictable and scalable migration given existing voice infrastructure is point-to-point and the same regardless of the number of end point being deployed.

Separate LAN with PoLRE and Enabling Hosted IP Platform
Quick, Easy and Cost Effective IP Migration

IDF

IDF

IDF

IDF

IDF

Cloud IP PBX

Telephony Network

Telephony Team

Profit and Loss Network

IT Team

Protection Network

Security Team

The benefits of extending your LAN using the Chariot series of Long Reach PoE switches goes way beyond the technical advantages. They include:

Extend the Network and Save Money and Improve Your Return on Investment.

Customers are saving between $100 and $1,000 an end point by using the long reach PoE switches. Many customers are using the freed up budget to allocate more to applications driving a better return on investment.

Extend the Network and Unite and Empower Your Teams.

Many decision makers found that using the Chariot series long reach PoE switches the voice and security teams could help in deploying the new IP solutions including the infrastructure.   This elevated the pressures put on the IT teams and allowed them to work together and successfully migrate to an all IP platform.

Extend the Network and Eliminate Risk and Disruption.

The ability to leverage and existing infrastructure allows customers to complete proof of concepts in their environment without the need to rip-and-replace the entire infrastructure or with any impact or disruption to their production network.

In addition with an end-to-end platform customers with multiple locations can completely configure and deploy the applications, infrastructure and end points in a central location and once complete send the entire kit to site knowing the only thing that has changed is the wiring infrastructure connecting the end points to the PoE switches. Government agencies with global locations applied this practice to successfully migrate to IP.

Extend the Network and Fast track Your Migration.

Businesses have fast tracked their IP migration by using the Chariot series of long reach switches to transform their existing infrastructure to a robust IP platform with power. By fast tracking their all IP migration customer experienced greater savings by not having to manage two separate systems; the legacy system and the new IP system.

Extend the Network and Enhance Security

By extending the network using the long reach PoE switches business are creating a robust and highly secure platform. Security is enhanced in three ways.

1. Physical separation or controlled LAN extension with a single cable. The LAN can be configured in a manner to allow for limited or no access to the production network.
2. MAC Port locking capabilities allowing you lock down a port to a specific device via the unique MAC address of the device.
3. Dedicated out of band management port on the switch that provides secure limited access to the switch fabric.

Extend the Network and Simplify Planning, Configuring, Deploying and Managing the Network

Having the option to leverage an existing infrastructure that is proven to be effective, and, in the case of voice and CCTV video, is designed point-to-point which is ideal for real-time latency applications, greatly simplifies the migration. The long reach PoE capabilities combined with the easy to understand GUI interface offered by the Chariot series of switches allows customers to gracefully migrate on their terms creating ether a separate of integrated LAN topology with ease. Planning, configuring, deploying and managing the LAN for all IoT end points is simple when you extend your LAN with Chariot switches.

Creating IoT connections for PoE enabled end points in your buildings is easier than you think now that you know about the Chariot series of long reach PoE switches by NVT Phybridge. We encourage you to learn more about these switches and how these switches have helped thousands of business migrate to IP with confidence.